Solar Laptop/Device Charger

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TOOLS:

- Multimeter or Continuity Tester (1)
- Soldering/desoldering tools (1)

PARTS:

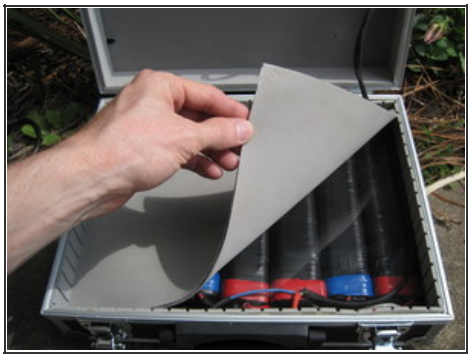
- 5 Watt Solar Panel Operating voltage 12-17 volts (1)
- Solar Charge Controller (1)
- 12 Volt Car Power outlet (1)
- 12 Volt Battery Packs (1)

SUMMARY

First off, be careful with those battery packs. I used old 18-volt cordless battery packs from the tools you get at Harbor Freight, and if you're not careful you can zap yourself pretty good if they are still holding a charge. If you have access to new Ni-Cad batteries (look on eBay) I would go that route, although $ is always a limiting factor.

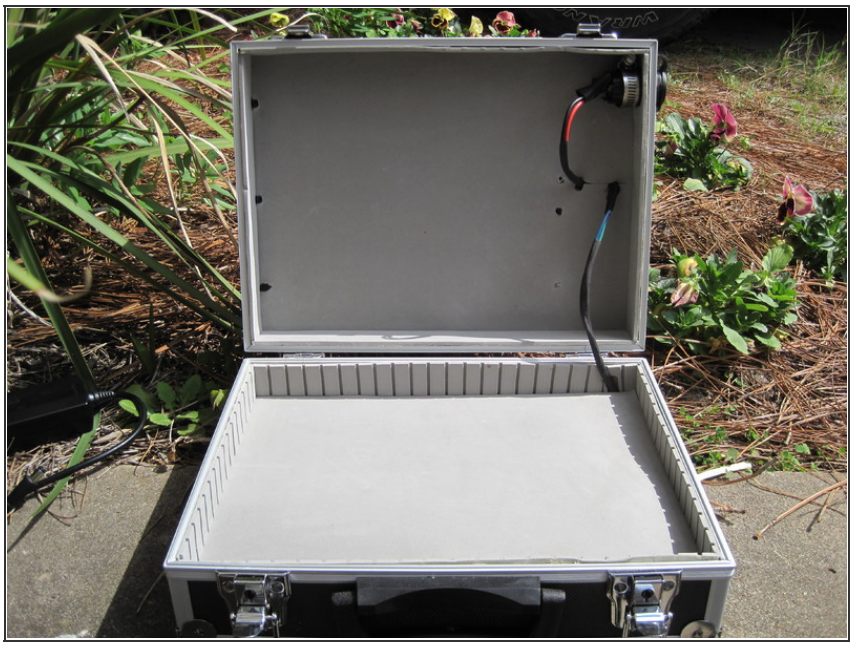
Step 1 — Solar Laptop/Device Charger





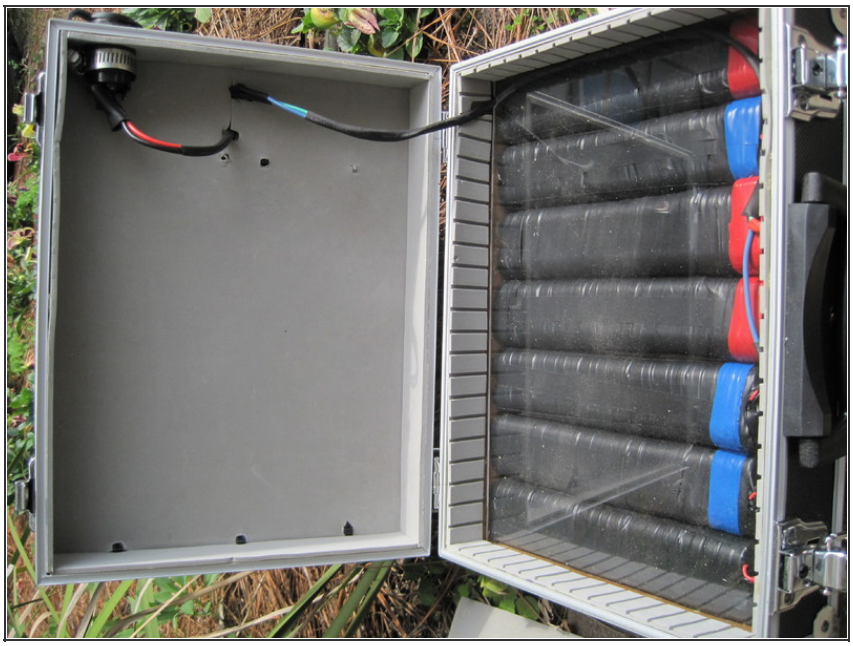
- Why pay $200 for a laptop charging case when you can make one yourself?

Step 2



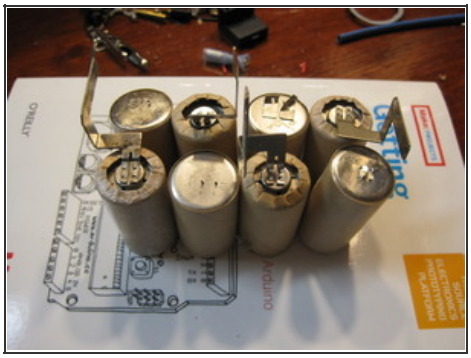
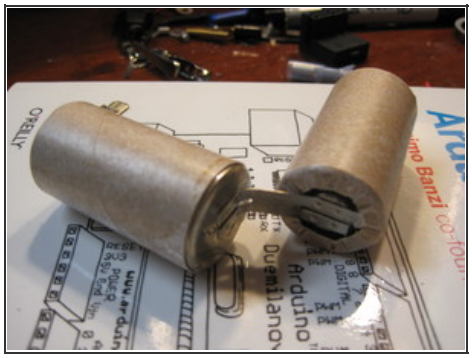
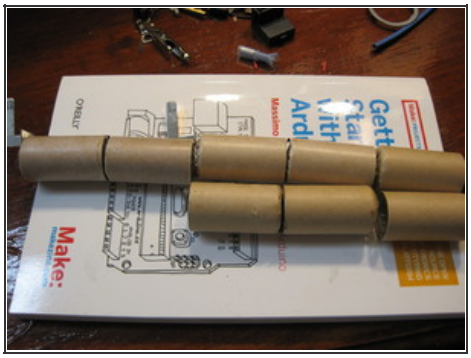
- First things first. Get a case that you would like to use, ideally a little larger than your laptop or other device that you would like to keep charged.
- Make sure that it is large enough to mount a panel to. Most 5-watt panels are about 10.5" x 9". The case I decided upon was 12-1/2" x 9-1/4" x 3-3/4” deep and available from American Science & Surplus for $12.50. (Shameless plug, but I love their website.)

Step 3



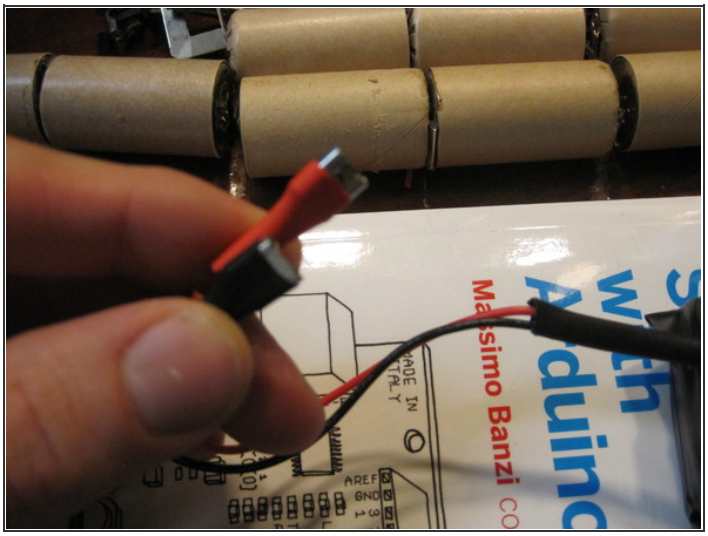
- Strip out all of the interior padding in the case.
- Then take apart your battery packs (carefully) and configure them as 12-volt packs. I ended up with 7 running in parallel.
  - Most of the Ni-Cad packs I took apart used Torx bits. If you are on Make: Projects, I am going to go ahead and assume that you have a full tool kit.
  - The number of packs to use is up to you. I am going to play with the total capacity and see how it works.

Step 4 — Making the battery packs.

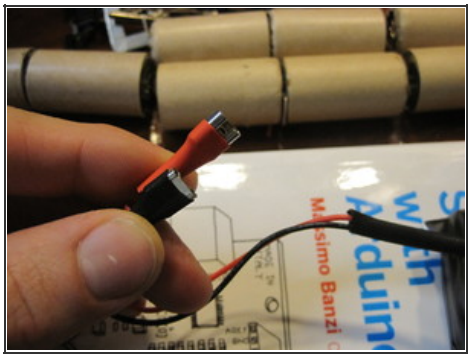
- After disassembling the housing that holds the batteries you want to salvage, you should have something similar to what is in the pictures. I didn't think to take a picture of mine when I disassembled it, but using the leftover cells I can demonstrate how to put them together.
  - The cells I used were Ni-Cad 1700mAh (milliamp-hours). This means that they can supply 1700mA for one hour, 850mA for two hours, 425mA for four hours, etc.
  - If you take apart 2 different types of batteries, you will most likely have similiar cells that were manufactured in different locations. In any case, make sure you keep similar cells together.
- OK; if you took apart an 18V battery pack you should have 15 of the cells all tabbed together. Find the best 10, which for me were the ones starting with the positive lead. Count out 10 cells, then snip off the tab holding them together and put the rest of the cells to the side.
- If you have 14.4V packs, it's the same thing except you'll have 12 cells to work with. Again, find the best 10.
- Here comes the difficult part, at least for me. You want to end up with a long flat pack that easily fits within your case, so you need to "fold" the cells and the tabs connecting them so that there are 2 rows of 5 cells each, all held together by their factory tabs.
  - You dont want to break those tabs. Soldering those batteries is a pain, and heating them up isn't really a good idea.

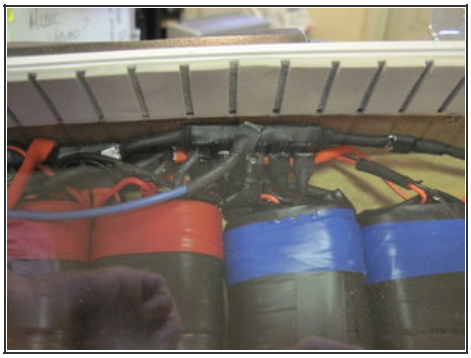
Step 5 — Finishing the battery packs



- Ok, I found it easiest to use 1" shrink tubing to seal in each of the two 5-cell rows, then wrap them in electrical tape.
- If you don't have heat-shrink tubing, electrical tape works well enough. It is just a little difficult to handle the packs without breaking the tabs.
  - When I ran out of heat-shrink tubing, I used zip-ties to secure the cells and cut off the ties as I wrapped them in electrical tape.
- Leave the top of the cells exposed so that you can add power leads.
- I used about 6" of 14-gauge stranded black and red for the terminals.
  - Securing the leads to the top of the batteries can be difficult. I had left the remnants of the tabs so I could fold them over an O-ring style terminal connector. I then added a few drops of solder to hold them securely.
  - A useful trick is to leave one terminal lead a little bit shorter than the other, so that they cannot touch easily. If the wires are the same length they can collide easily, discharging the batteries.

Step 6 — Leads for the packs





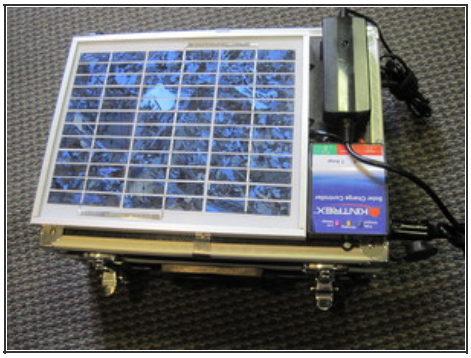
- After securing your leads to the top of the batteries, wrap them as tightly as possible with electrical tape. You really don't want them coming loose.
- Add your favorite type of female quick-connects to the end of the leads, and cover them in heat-shrink tubing to keep them shielded.
- Put your completed packs into your case.
- Then, link your packs together. I simply made 2 terminals, one positive, one negative, with 7 male plugs for all the batteries to consolidate to one 12-gauge wire which connects to the positive and negative battery terminals on the solar charge controller.
  - The blue wire in the picture is leading to the negative terminal connections. The positive is a bit buried. It is all wrapped in heat-shrink wrap.
  - Can you tell I like heat-shrink wrap yet? God's gift to makers.

Step 7

- OK; configuring the packs was the hard part. Now we just hook everything together.
- Drill holes through the frame of the solar panel, and the top of the case, large enough for a zip-tie to go through. The top of the case is going to need 2 holes about 1/4" apart for the zip-tie to loop through.
- Drill holes to mount the solar controller and mount it with screws. Also, cut off any connection tips on the controller, so you can directly solder the connections, and drill holes in the case to accommodate the wires.
- Mount and run the wires for the battery cables. Connect these last.
- Mount the solar panel and loosely tighten the zip-ties. Make sure that the wiring is properly connected to the "Solar Panel" leads on the charge controller and that the connections are secure before completely tightening the zip-ties.
- Then drill a hole for the car power adapter. Wrap the outlet with electrical tape to make sure it is a snug fit, then secure it with a hose clamp. Solder the connections last.
- The outlet connects to the "Load +" and "Load -" wires on the charge controller. You can wire it directly to the battery pack, but connecting it to the controller will help protect

your devices from uneven voltage that can come from the solar panels.

Step 8 — Finishing up



- OK; you are almost there. All we have to do now is attach your device charger to the 12V car adapter. Plug it all in and set it in the sun.
- I ended up adding some Velcro to the back of the laptop's charger so I could secure it underneath the solar charger.
  - I also ended up drilling a small hole in the side of the case, so I could leave the laptop inside the case while it charged.
- That's it! Hope it worked out for you. I would recommend leaving it out in the sun for a day or two before actually using it. That way the batteries get nice and charged up before you put them under a load.
- Now you should be able to charge anything you have a car adapter for!

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